

B 39/Chester/inat.

Chester O. Peterson

Chester O. Peterson Exercise

Instructor's Copy

Behavioral Research Aspects of Safety and
Health Group (BRASH)
Institute for Mining and Minerals Research (IMMR)
University of Kentucky, Lexington, Kentucky

November 1987

This latent image exercise was developed and field tested under U. S. Bureau of Mines research Contract No. HO348040. Information about the design and characteristics of the exercise and the field test results are available in the project technical reports filed with the Bureau of Mines Research Center in Pittsburgh, PA. This is one of more than 30 exercises designed for use in annual refresher training to teach and test critical skills for coping with mine emergency situations. The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies or recommendations of the Interior Department's Bureau of Mines or the U. S. Government.

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Appendices

Appendix A: Problem booklet (duplicate this copy for use in class)

Appendix B: Answer sheet blank (print the latent image answers on this)

Appendix C: Latent image answers (print these on the answer sheet)

Introduction

This document contains most of the materials needed to use the exercise. The main part of the document is the instructor's copy. It tells how to use the exercise, presents the objectives, the master answer sheet, the scoring key, and discussion notes to be used following the exercise. The next section summarizes the results from field tests of the exercise, and reports the miners' evaluation of the activity. The last part of this document is three appendices. Appendix A is the exercise problem booklet. This booklet can be duplicated locally. The booklets are reusable. One is needed for every person in the classroom. Appendix B is the answer sheet and the trainee's questionnaire. Copies of this answer sheet must have the latent image (invisible) ink answers that appear in Appendix C printed on them¹. Answer sheets are consumable. One is needed for each person or each small group of persons who work the exercise.

Exercise Summary

Read this section first. It determines if the exercise is appropriate for your classes. If you choose to use the exercise, examine the table of contents and review the remainder of this document.

Type: Latent Image

Length: Nine questions (25 minutes for administration plus 30 for discussion)

Skills: Mine ventilation basics
Recognizing symptoms for CO poisoning
Proper procedures for ventilation of blasting gases from mine faces
Safe rescue operations for assisting downed victims in bad air without endangering one's own life

Location: Underground

Problem: You are a scoop operator. During the first part of the shift an entry was shot and partly loaded. Two miners have complained that they were dizzy and sick to their stomach. Otherwise the shift has gone on as usual. You reenter the mine after lunch and notice that some smoke is still hanging. You are worried the ventilation may not be adequate. Soon two miners at the face go down. You must decide what to do to help them.

¹ You can do this yourself if you have the proper equipment, or you may wish to purchase copies of preprinted latent image answer sheets from the University of Kentucky, IMMR, 234 Mining and Minerals Resources Building, Lexington, KY 40506-0205, (606) 257-8636, or the National Mine Health and Safety Academy, P.O. Box 1166, Beckley, WV 25802-1166, (304) 255-0451.

HOW TO USE THIS EXERCISE

1. Look at the performance objectives. Decide if the exercise is relevant for your annual refresher class.
2. Work through the exercise with the special pen and score your responses.
3. Read the master answer sheet for the exercise. Look at all the answers.
4. Read the "Instructor's Discussion Notes" for the exercise.
5. Become thoroughly familiar with the problem so that you can present it to your class without reading it. Put the maps or illustrations on an overhead projector so you can use these to help explain the problem.
6. When you present the exercise to the class:
 - Explain that the answers from class members will be used to improve the exercise in the future.
 - Give each person an exercise booklet, an answer sheet, and a pen.
 - Demonstrate how to select and mark answers using the special pen.
 - Go over the instructions for doing the exercise with the whole group.
 - Explain the problem making sure everyone understands the problem situation.
 - Have the class members work the exercise.
 - When the class members finish, have them figure up their score using the instructions at the end of the exercise.
 - When everyone has finished, discuss the exercise. Let class members discuss the merits of each answer. Add your own ideas. Then have each person fill out the Trainee's Questionnaire attached to the answer sheet.
 - After class look over the completed trainee's questionnaires and the answer sheets. This information may provide ideas for improving the exercise for future classes. Write out your ideas for improving the exercise and send them to the following address.

IMMR/BRASH
201 Porter Building, University of Kentucky
Lexington, Kentucky, 40506-0205 ph. (606) 257-3796

Performance Objectives for Chester O. Peterson Exercise

<u>Objective number</u>	<u>Capability verb(s)</u>	<u>Description of required performance and conditions under which it is to occur</u>
1MG	Recognize	Potential danger that exists when smoke hangs after shots have been fired
2EE	Assess Plan	Course of action for recovering an unconscious victim from a mine entry with a potentially lethal atmosphere.
3EE	Evaluate Select	Actions which should be taken for assisting multiple victims who have been overcome by toxic mine gasses when only one rescuer is at the scene
4MG	Evaluate	Rapid, safe methods for ventilating a mine entry
5MG/EE	Recognize Plan Execute	Safe rescue operations for assisting victims in back air
6MG	Recall Recognize	Importance of proper pre-shift and on-shift examinations
7MG	Recall Recognize	Symptoms of CO poisoning

*Skill and knowledge domain abbreviations:
 EE = Emergency evacuation and escape
 MG = Mine Gases

Master Answer Sheet for Chester O. Peterson Exercise

Use this answer sheet to mark your selections. Rub the special pen gently and smoothly between the brackets. Don't scrub the pen or the message may blur. Be sure to color in the entire message once you make a selection. Otherwise you may not get the information you need.

Question A (Choose only ONE unless directed to "Try again!")

1. [The assistant foreman tells you to go load entry 3 like your supposed to. Try]
[again!]
2. [Correct! The assistant foreman tells you that he will take care of it later. Do]
[next question.]
3. [There is something else that you should do now. Try again!]
4. [Entry 3 doesn't need a curtain for ventilation. Try again!]

Question B (Choose only ONE unless directed to "Try again!")

5. [There is something you should do first. Try again!]
6. [There is something you should do first. Try again!]
7. [This is not the best thing for you to do. Try again!]
8. [Correct! Do next question.]

Question C (Choose only ONE unless directed to "Try again!")

9. [This will put you and Speedy in danger. Try again!]
10. [This is not the best thing to do now. Try again!]
11. [Correct! You go to entry 5 and tell the assistant foreman that Chester is]
[down. Do next question.]
12. [This will put you in danger. Anyway, this is not the time to argue with]
[Speedy. Try again!]

Question D (Choose only ONE unless directed to "Try again!")

13. [Soon all of you are down and no one is left to help you. Try again!]
14. [This will put you in danger. Try again!]

Question D (continued)

15. [Correct! The assistant foreman keeps moving toward the face. You]
[tram your scoop to entries 1 and 2 and pick them up. Do next question.]
16. [Although this is a tough decision to make, SCSRs are to be used only for]
[escape. . . not for rescue. Try again!]

Question E (Choose only ONE unless directed to "Try again!")

17. [Correct! This is the safest option. Do next question.]
18. [This is not possible. You would be overcome. Try again!]
19. [SCSR are not to be used for rescue. Try again!]
20. [By the time they arrive, it will be too late to help the victims. Try again!]

Question F (Choose only ONE unless directed to "Try again!")

21. [This will not ventilate entry 4. Try again!]
22. [This is not the best way to ventilate entry 4. Try again!]
23. [This is not the best way to ventilate entry 4. Try again!]
24. [Correct! This is the best way to ventilate entry 4. Do next question.]

Question G (Choose only ONE unless directed to "Try again!")

25. [This is not the best thing to do. Try again!]
26. [There may not be enough time to wait for the rescue team. Try again!]
27. [Correct! Do next question.]
28. [This is not the best thing to do. Try again!]

Question H (Select as MANY as you think are correct.)

29. [Correct! The ventilation as shown on Figure 1 was not adequate. This]
[should have been noted during the preshift examination and corrected.]
30. [A flame safety lamp will not tell you when small but deadly levels of CO are]
[present.]

Question H (continued)

31. [Correct!]
[]
32. [Equipment should not be taken into the working face until a methane test is]
[made.]
33. [Correct! Miners should know symptoms of CO poisoning, of poisoning from]
[other mine gases, and of O₂ deficiency.]

Question I

END OF PROBLEM

Finding your score

Number of "Correct" answers you colored in = (1) _____

23 minus the number of incorrect answers you colored in = (2) _____

Add blanks one and two to get your total score = (3) _____

Highest possible score = 33

Lowest possible score = 0

TRAINEE'S QUESTIONNAIRE

- 1) name of exercise _____
- 2) your age _____ 3) your sex _____ M _____ F 4) years underground coal miner _____
- 5) your job title _____

Check all the areas in which you have special training, certification, and/or that you routinely perform.

	<u>Special Training</u>	<u>Certification</u>	<u>Routinely Perform</u>
6) Mine Foreman	_____	_____	_____
7) Mine Safety Committee	_____	_____	_____
8) Mine rescue	_____	_____	_____
9) CPR	_____	_____	_____
10) Advanced first aid	_____	_____	_____
11) EMT	_____	_____	_____
12) Advanced life support	_____	_____	_____
13) Other (describe) _____	_____	_____	_____

Think about the exercise you just finished. Circle the number which tells how much you agree or disagree with the following statements.

	<u>Definitely Yes</u>		<u>Definitely No</u>	
14) This problem could happen in real life.	4	3	2	1
15) This exercise will help me remember something important if I am ever in a similar situation.	4	3	2	1
16) I learned something new from the exercise.	4	3	2	1
17) The exercise took too long to complete.	4	3	2	1
18) I liked working the exercise.	4	3	2	1
19) The instructor's directions were clear.	4	3	2	1
20) The written directions in the exercise were easy to understand.	4	3	2	1
21) The diagrams, charts, and pictures were easy to understand.	4	3	2	1
22) The scoring procedures were easy to understand.	4	3	2	1
23) The exercise was easy to read.	4	3	2	1

If you have anything more to say about the exercise, please write on the back of this page. Thank you.

Instructor's Discussion Notes for Chester O. Peterson Exercise

Use the information presented here and on the master answer sheet, your own ideas and experience, and that of the miners in your class to discuss the exercise after it is completed. Group discussion can strengthen knowledge and skills, correct errors, and relate the exercise content to the experiences of the miners. After they have worked the exercise, miners enjoy discussing the problem. They also frequently think of better ways to respond to a problem than those listed among the answers. The purpose of the exercise is to help miners think about and remember basic knowledge and skills they may someday need to deal with a mine emergency. The discussion following the exercise can contribute to this goal and tailor the exercise content to the needs of the group you are training.

It is helpful to show overhead transparencies of the answers on the master answer sheet during the discussion, while the miners look at their problem booklets. This allows you to lead the group through the exercise and to discuss all the answers to each question. Most of the information about why particular answers are correct or incorrect is given on the master answer sheet.

The following notes provide additional information for you to discuss with your class. Read through and think about the notes before the class. Don't read the notes to the class members. This would be boring and ineffective. Rather, incorporate the ideas you find here with your own ideas and make these points at the appropriate place in the discussion of the exercise.

Question A - The correct answer is 2. A curtain should be hung so that the smoke will clear. Entry 3 is not yet large enough to need a curtain. This is a good place to discuss why miners should not assume that someone else will take care of a problem that they recognize. They should report the problem or correct it before continuing with their work.

Question B - The correct answer is 3. This should be done so that the assistant foreman will know that there is a problem and so that he can help. Telephoning outside is important, but it is faster to get help from other miners on the section if possible. This is a good point to discuss whether or not a miner should enter a place if only one miner is down.

Question C - The correct answer is 11. Choices 9 and 12 both put rescuers in danger. Restoring ventilation is important, but more help should be found first.

Question D - The correct answer is 15. With 2 miners down and another in trouble, more than one rescuer will be needed. It is most important that miners realize that they should not place themselves in danger while trying to help their co-workers. If a would-be rescuer goes down, all the other miners may die because no one will be able to get help.

Question E - The correct answer is 17. The safest way to help the victims is to get good air into the entry as soon as possible. It would probably be impossible for the miners to hold their breath and drag the men to good air. They would likely be overcome. The victims will not survive if nothing is done until a mine rescue team can arrive.

Whether or not SCSR should be used in these situations is a point that is strongly debated by many miners. They are designed to be used only for self rescue and escape and are approved only for that purpose.

Question F - The correct answer is 24. More curtains than are necessary are hung in option 23. This would waste time. Option 22 would ventilate the entry, but 24 allows the rescuers to advance with good air at their backs. The blowing system in option 24 would also be more effective in moving clean air to the downed miners than would the exhausting system.

Question G - The correct answer is 27. Time is an important consideration at this point. There may not be time to wait for a mine rescue team or for more equipment. Staying between the rib and the curtain, as it is shown in answer 24 will allow the miners to advance into the entry while staying in good air. Getting good air to the unconscious miners by using a blowing curtain arrangement can save their lives.

Question H - The correct responses are 29, 31, and 33. Choice 32 is not correct because the scoop should not be taken in by the last open crosscut before a methane test is made. Choices 29 and 31 are correct. It is important to check and maintain good ventilation. Choice 33 is also correct. Miners should be aware of the symptoms of CO poisoning, of poisoning due to other mine gases, and of oxygen deficiency.

References

- Ellis, C.E., Schmidt, W.R., and Watson, A.K., Report of Multiple Fatal Explosives Accident (Carbon Monoxide Poisoning), No. 3 Mine (ID No. 15-13127), August 15, 1985.
- Forbes, J.J., and Grove, G.W. (1954). Mine gases and methods for detecting them (Miner's Circular No. 33). Washington D.C.: U.S. Bureau of Mines.
- Kumar, S. (1985). Mine gases. In F. Cameron (Ed.), The Kentucky underground coal mine guidebook (pp. 119-129). Lexington, KY: The Kentucky Mining Institute.
- Hartman, H. L., Mutmansky, J. M., & Wang, U. J. (1982). Mine ventilation and air conditioning (2nd ed.). New York: Wiley.

Scoring Key for Chester O. Peterson Exercise

Question A

1. __W__

2. __R__

3. __W__

4. __W__

Question B

5. __W__

6. __W__

7. __W__

8. __R__

Question C

9. __W__

10. __W__

11. __R__

12. __W__

Question D

13. __W__

14. __W__

15. __R__

16. __W__

Question E

17. __R__

18. __W__

19. __W__

20. __W__

Question F

21. __W__

22. __W__

23. __W__

24. __R__

Question G

25. __W__

26. __W__

27. __R__

28. __W__

Question H

29. __R__

30. __W__

31. __R__

32. __W__

33. __R__

Summary of Field Test Results

The Chester O. Peterson Exercise (COP) underwent two rounds of field testing, including authentication and one field test. The authentication consisted of a small initial field test that produced too little data for meaningful statistical summaries. However, the many comments, criticism, and suggestions received were used to revise and improve the exercise before the formal field test. The formal field test involved carefully controlled administration of the revised exercise to groups of miners. Tables that summarize the results of the field test for COP1 are attached. The version of the exercise included in this document includes all of the cumulative revisions made as a result of the two rounds of field tests.

COP1 was field tested with 28 miners, in 2 classes, at 1 site. A set of tables is attached for the field test results. The set of tables is divided into two parts. The first part describes the people who participated in the field test and their evaluation of the exercise. The second part describes the measurement properties of the exercise.

Sample characteristics and miners' evaluations

Tables 1 through 3 describe demographic characteristics of the sample. Table 4 indicates the number of persons in the sample who reported either some training, special certification, and/or routine performance of the eight areas listed as rows in the table. Inspection of these tables quickly reveals the numbers and types of persons involved in the field test of the exercise.

Table 5 reports the miners' judgment of the exercise quality and worth. Each person was asked to rate the value of the exercise on each of ten qualities. By checking a number on a scale, miners indicated to what extent the exercise displayed each quality. Inspection of the values in Table 5 reveals the percentage of miners who reported that the exercise 1) was realistic, 2) helped them to remember important things, 3) helped them learn something new, 4) was too long, 5) was enjoyable, 6) instructor's directions were clear, 7) written directions were clear, 8) illustrations and maps were clear, 9) scoring procedures were easy to understand, and 10) was easy to read.

Psychometric properties

The next set of tables describe the psychometric (mental performance measurement) properties of the exercise. Table 6 presents summary data for each of the exercise questions, including the minimum, maximum, median, and mean question scores observed in the sample; the standard deviation and skewness of each question score; the squared correlation coefficient of each individual question score with the exercise total score; and the estimated reliability of the total exercise score if that particular question were dropped from the test. The last line in Table 6 reports the same information for the total exercise score. This is obtained by summing question scores across the whole exercise. Each question is weighted such that a perfect score on each question sums to 100 for the exercise total score. Inspection of the table quickly

presents the basic performance data for the sample.

The weighting of each question score to produce a total score of 100 is designed to allow comparison of the difficulty of different versions of the same exercise, or different exercises, even though these often have different numbers of questions. The total score of 100 is also a common convention for reporting test scores.

Table 7 reports the number of answers (options) to questions that discriminated properly between persons with high scores on the test and those persons with low scores. Tests that have multiple choice answers to questions must include some incorrect and some correct answers. The person who takes the test must choose among correct and incorrect answers (distractors) to each question. Persons who get a high total score on the test know more about the test content than persons who get low scores. Therefore, when data are aggregated from the whole sample of persons who took the test, wrong answers (distractors) to each question on the test should be significantly negatively correlated with the overall test score, and correct answers to questions should be significantly positively correlated with the exercise total score. When correct answers and wrong answers (distractors) behave this way, the answer (whether correct or incorrect) is said to positively discriminate between persons who know much about the content and those who know little. However, when persons who get high scores on the total test tend to pick wrong answers (distractors) more frequently than persons who get low scores, the answer is said to reverse or negatively discriminate. The opposite case is also true. That is, when persons who get low scores on the total test score tend to pick a right answer to a question more frequently than persons who had high total test scores, that answer is also said to reverse or negatively discriminate. The discrimination values are used to identify and correct problems in the answers for questions. To be valid, the method requires an adequate sample of persons who exhibit a wide range of variability in their total test scores.

Table 7 reports the frequency with which answers to questions behaved in this desirable way. The table tells the percentage of answers to questions on the test that discriminated positively, negatively, or not at all among the ability levels represented in the field test sample.

Another way to look at the discrimination capability of a test is to divide the sample into groups of persons with greater or lesser levels of expertise. Table 8 reports the degree to which the exercise total score discriminated between persons in the sample with different levels of self-reported first-aid training. The means and standard deviations for these two groups are given as well as the F ratio and the p value.

Table 9 is another discrimination analysis for the total exercise score, this time between the self-reported major job categories represented in the sample. The category "miners" includes all working miners who are not supervisors, surveyors, engineers, etc. The "maintenance/technical" category includes all inspectors,

engineers, surveyors, electricians, mechanics, and other technical and maintenance personnel who work in the mines and typically have special skills, and who move from

section to section as they complete their work. The "supervisory/management" category includes all managers from the mine section foreman on up. The "other" category includes all other persons such as preparation plant and surface mine workers, personnel, office staff, and others who are not miners but who often participate in annual refresher training classes.

Finally, the last table examines the degree to which miners in the field test sample exhibited mastery of the mine emergency judgment and decision making skills assessed by COP1. The metric used in this analysis is a scaled score ranging from 0 to 100. A 90 percent or higher mastery performance criterion by 95 percent of the sample is a reasonable expectation for technically trained personnel in critical skill performance. However, 70 percent mastery was achieved by only 89.2 percent of the miners on COP1. The reason for this lower than anticipated mastery level may be the relatively infrequent practice of the needed skills. This suggests that the content of COP1 has been appropriately targeted.

The number of miners reported in the tables varies. This is because not all miners answered all of the questions on the trainee's questionnaire. Also, some of the data received from the field tests reflect individual performances, while other data reflect small group performance. Instructors often had the miners work the exercise in small groups. This is a good instructional procedure that miners enjoy. However, the psychometric studies require individual exercise administration in order to carry out the discrimination analyses. Therefore, Tables 1 through 5 report the actual or valid percent of persons who responded to specific items on the trainee's questionnaire. The remainder of the psychometric tables report data for the number of persons who properly completed the exercise individually.

Characteristics of the COP exercise

The mean score on COP1 was 82.2 with a standard deviation of 9.74. The exercise did not discriminate between those persons with advanced and basic levels of first aid training or between job categories. This may be a result of the small sample size. If the exercise were field tested with a larger sample of miners, including a wider range of knowledge and skill, the exercise would probably discriminate between job categories and training levels. The four supervisors in the sample, and the seven maintenance/technical personnel scored higher than the working miners. With a larger sample, these observed differences would probably become statistically significant. Inspection of Table 7 also reveals that 62 percent of the answers properly discriminated between miner's total performance score, and that the exercise contained no negatively discriminating answers. The sample of miners and trainers involved in the field test of COP report the exercise is useful in teaching and reinforcing critical skills.

Characteristics of the field test sample for COP1 Exercise

(1 site, 2 classes, n =28)

Table 1: Age and experience of miners (years)

	<u>n</u>	<u>mode</u>	<u>mean</u>	<u>s.d.</u>
age	23	35	33.2	4.18
experience	22	9	9.9	2.94

Table 2: Gender distribution (%)

	<u>n</u>	<u>frequency %</u>
female		
male	24	100.0

Table 3: Job classification

	<u>n</u>	<u>frequency %</u>
miner	10	47.6
maintenance/technical	7	33.3
supervisory/management	4	19.0
other		

Table 4: Self-reported level of expertise (frequency %)

<u>category</u>	<u>training</u>	<u>certification</u>	<u>performance</u>
foreman	12.5	16.7	4.2
mine safety committee	8.3	4.2	8.3
mine rescue	4.2	4.2	0.0
CPR	45.8	12.5	4.2
advanced first aid	16.7	0.0	0.0
EMT	8.3	4.2	0.0
advanced life support	0.0	0.0	0.0
other	0.0	0.0	0.0

Table 5: Miners' rating of exercise validity, relevance, quality, and utility (frequency %)

<u>content</u>	<u>definitely yes</u>		<u>definitely no</u>		<u>mean</u>	<u>s.d.</u>
	4	3	2	1		
problem could happen	78.3	17.4	4.3	0.0	3.7	0.54
help remember important things	43.5	43.5	4.3	8.7	3.2	0.90
learned something new	27.3	40.9	22.7	9.1	2.9	0.94
exercise too long	0.0	17.4	34.8	47.8	1.7	0.77
liked working the exercise	52.2	26.1	17.4	4.3	3.3	0.92
instructor's directions clear	78.3	13.0	8.7	0.0	3.7	0.64
written exercise directions clear	8.7	52.2	26.1	13.0	2.6	0.84
graphics easy to understand	26.1	56.5	8.7	8.7	3.0	0.85
scoring easy to understand	30.4	47.8	21.7	0.0	3.1	0.73
exercise easy to read	31.8	40.9	22.7	4.5	3.0	0.87

Psychometric properties of COP1 Exercise

(printout date 7/9/87, 1 site, 2 classes, n = 28)

Table 6: Question score and total score statistics

<u>question</u>	<u>minimum score*</u>	<u>maximum score*</u>	<u>median</u>	<u>mean</u>	<u>s.d.</u>	<u>skewness</u>	<u>R²_{QT}</u>	<u>alpha if question deleted</u>
A	3.4	14.3	14.3	12.0	3.11	-1.16	0.28	0.43
B	3.6	14.3	10.7	9.7	3.20	-0.04	0.19	0.36
C	3.6	14.3	12.5	12.0	2.79	-1.25	0.44	0.41
D	3.6	14.3	14.3	13.4	1.85	-2.04	0.20	0.57
E	3.6	14.3	12.5	11.5	3.42	-1.01	0.25	0.52
F	10.7	14.3	14.3	13.6	1.39	-1.78	0.28	0.42
G	2.9	14.3	8.6	10.0	1.39	-1.78	0.37	0.27
Total	62.9	96.4	81.1	82.2	9.74	-0.38	(alpha = 0.45)	

*The values reported are the minimum and maximum scores observed, for this sample. The lowest possible score = 0.0 and the highest possible score = 14.3. When scores are summed across questions the highest possible score = 100 and the lowest possible score = 0.

Table 7: Proportion of answers discriminating positively, negatively, and not at all with exercise total score ($p < .10$)

<u>positive</u>	<u>negative</u>	<u>no relationship</u>
18/29 (62.1%)	0/29 (0.0%)	11/29 (37.9%)

Table 8: Discrimination between basic and advanced levels of first aid training

	<u>n</u>	<u>mean</u>	<u>s.d.</u>	<u>F ratio</u>	<u>p value</u>
basic	11	83.0	9.84	0.13	0.72
advanced	13	84.3	8.28		

Table 9: Discrimination between job categories

	<u>n</u>	<u>mean</u>	<u>s.d.</u>	<u>F ratio</u>	<u>p value</u>
miner	10	81.7	10.0	0.62	0.55
main/tech	7	85.1	7.31		
super/mgt	4	87.1	8.79		
other					

Table 10: Number and percent of miners attaining various levels of proficiency (n = 28)

<u>exercise score</u>	<u>number at or above the score</u>	<u>percent at or above the score</u>	<u>cumulative percent</u>
100	0	0.0	0.0
90	9	32.1	32.1
80	7	25.0	57.1
70	9	32.1	89.2
60	3	10.7	99.9
50	0	0.0	99.9

Appendix A: Problem Booklet

Duplicate this copy of the problem booklet for use in your classes. Each person in your class should have a problem booklet while they are working the exercise. The problem booklets are reusable. To save effort and money, ask the trainees to avoid marking in the booklets and collect all the booklets after the class.

You may obtain copies of the problem booklet from the University of Kentucky or the National Mine Health and Safety Academy. The addresses and telephone numbers for these two agencies are listed in the footnote on page three of this document.

Chester O. Peterson Exercise

Problem Booklet

Behavioral Research Aspects of Safety
and Health Group (BRASH)
Institute for Mining and Minerals Research (IMMR)
University of Kentucky, Lexington, Kentucky¹

November 1987

¹ This latent image exercise was developed and field tested under U. S. Bureau of Mines research Contract No. HO348040 with the Bureau of Mines Research Center in Pittsburgh, PA. The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies or recommendations of the Interior Department's Bureau of Mines or the U. S. Government.

Instructions

Read the problem situation described on the next page. Study the map until you understand the location of the miners and equipment in the problem. Next, answer each of the 9 questions. Do them one at a time. Don't jump ahead, but you may look back to earlier questions and answers. For most of the questions, choose only one answer unless you are told to "Try again!" One question asks you to select as many answers as you think are correct. Follow the instructions for each question.

After you have selected a choice to a question, look up its number on the answer sheet. Select your answer to each question by rubbing the special pen between the brackets on the answer sheet. A hidden message will appear and tell you if you are right. When you have finished, you will learn how to score your performance.

Chester O. Peterson Exercise

Background

Drift mine

28 inch coal

Shooting from the solid in virgin coal

Scoop haulage

Good top

Problem

You are one of three scoop operators. During the first part of the shift, entries 1 and 2 were loaded. Entry 3 was shot and partly loaded. One of the other scoop operators, Speedy, complained that he was dizzy and sick to his stomach when he was at the face. Otherwise the shift has gone as usual.

It is now lunch time. Entry 4 (the heading and the right crosscut) was just shot. You and the rest of the crew are eating lunch outside and waiting for the smoke and fumes to clear before you reenter the mine to clean up entry 3 and load out 4.

Figure 1, on the next page, shows a map of the section. Ventilation and the location of the phone and SCSRs are just as they appear. After studying the figure, turn the page and answer the first question.

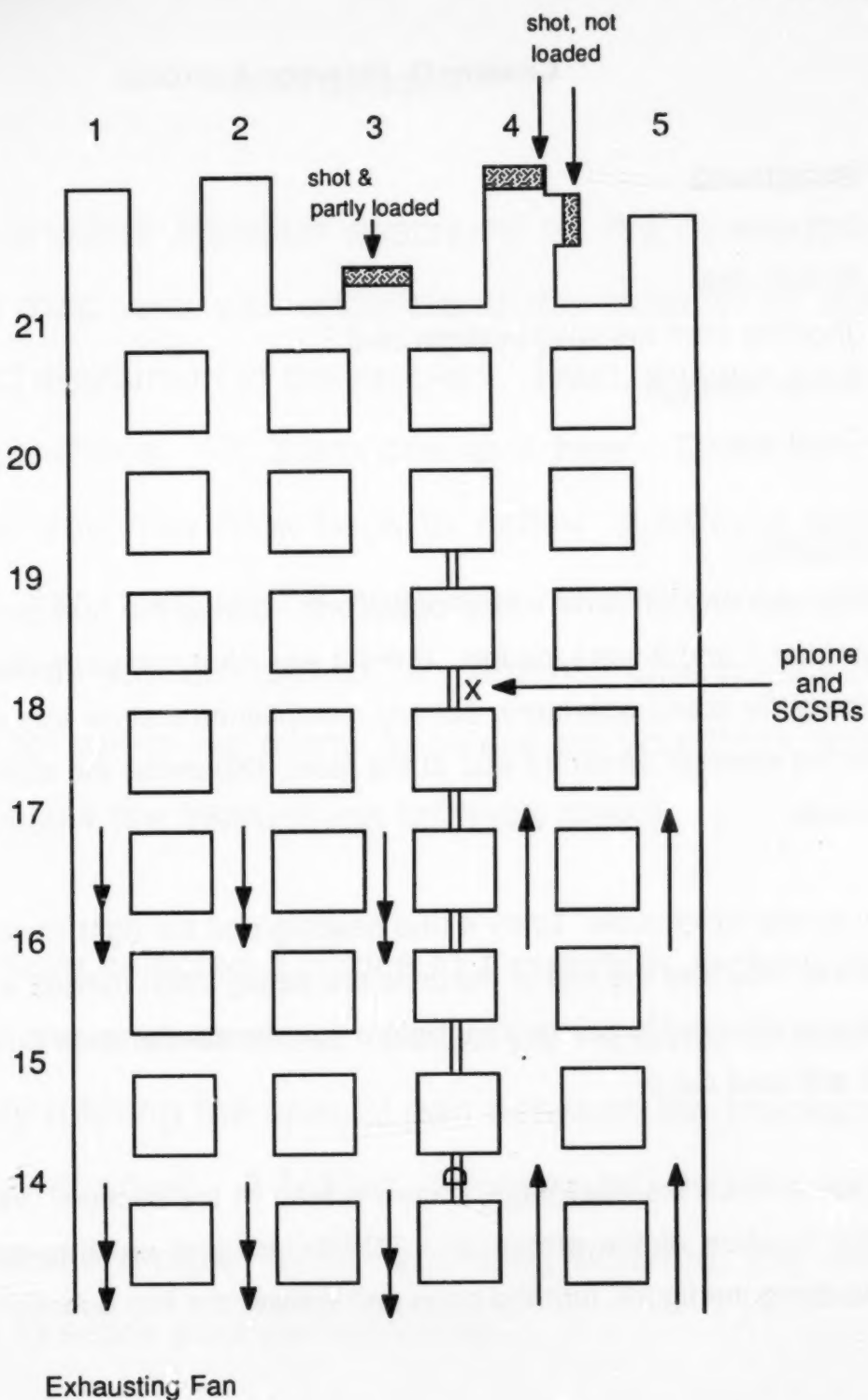


Figure 1: Section map

Question A

Speedy and Chester, the third scoop operator, tram their scoops in to start loading out entry 4. The assistant foreman is riding to the face with Speedy. You get into your scoop and follow them in on your way to clean up entry 3. When you get to cross cut 20 you see that some smoke is still hanging. The first two scoops have already started into entry 4. The smoke looks thicker there. What should you do? (Choose only ONE unless directed to "Try again!")

1. Stop your scoop and go into the entry to see what the others are going to do about the smoke.
2. Yell and ask the assistant foreman if he wants you to hang a check curtain in number 20 crosscut between entries 3 and 4.
3. Go on to entry 3 and do your job.
4. Hang a line curtain into entry 3 before you begin cleaning it up.

Question B

When you bring the last load outside from entry 3, the drill man and shooter ask for a ride to entry 1. You tell them that you feel dizzy and sick to your stomach. The driller says, "You scoop operators, you're always complaining about something."

As you go toward the face of entry 1, you pass Speedy's scoop. He says that Chester's scoop is stuck in the mud and he's on his way back from the shop with a chain to pull him out. He tells the drill man that the assistant foreman is marking entry 5.

After you drop off the drill man and shooter, you return to entry 4. As you go toward the entry, Speedy yells that Chester has passed out on his scoop. What should you do? See the map on page 6 for the locations of people and equipment. (Choose only ONE unless directed to "Try again!")

5. Telephone outside for help.
6. Go get the assistant foreman.
7. Go in and help pull Chester out of his scoop.
8. Tell Speedy to get out of the entry.

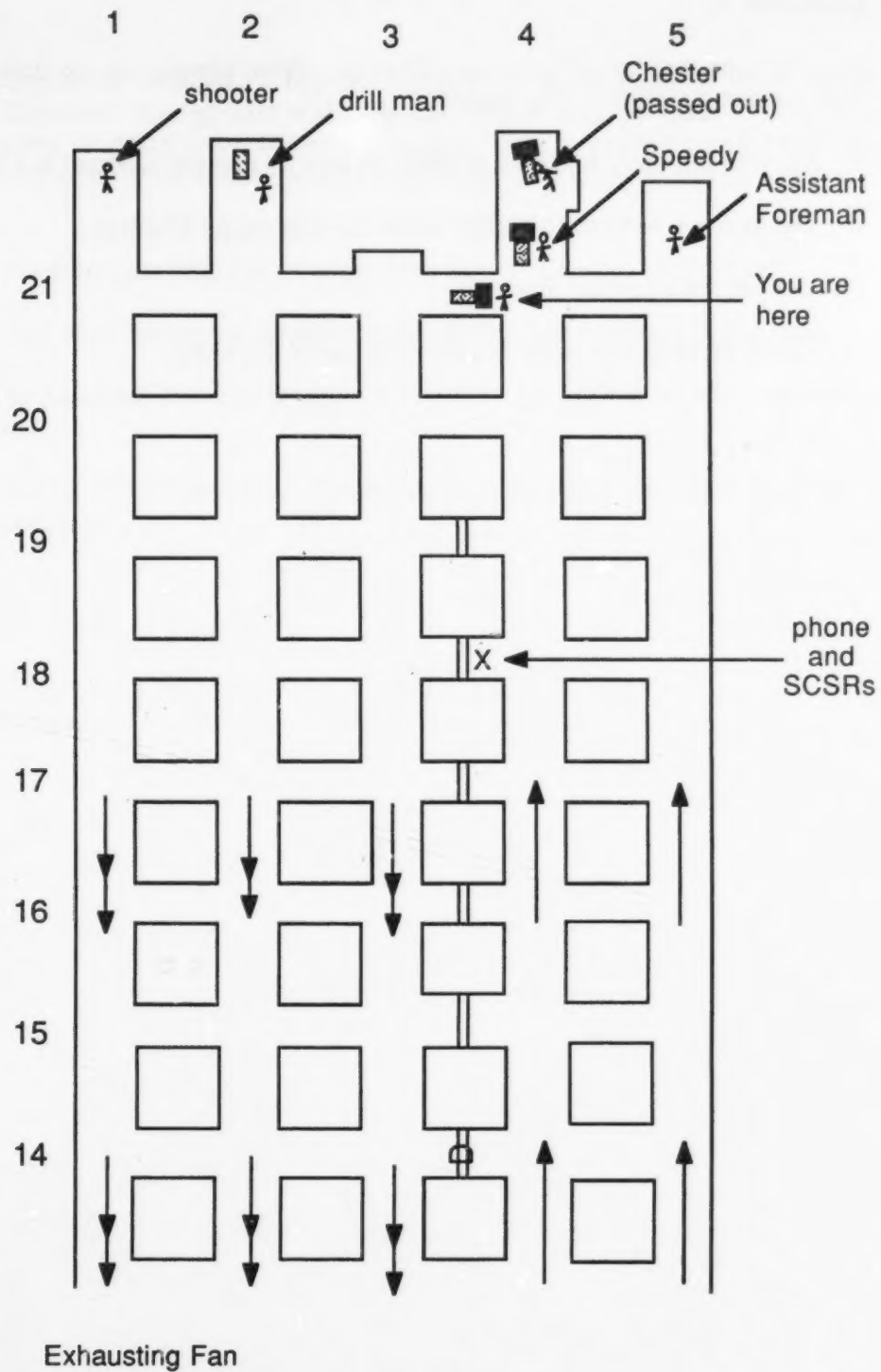


Figure 2: Section map with location of people and equipment

Question C

Speedy yells that he will not leave Chester. What should you do now? (Choose only ONE unless directed to "Try again!")

9. Go into the entry and help Speedy so that he can get Chester out faster.
10. Go look for ventilation curtain while Speedy helps Chester.
11. Go get the assistant foreman.
12. Go to Speedy and force him to come out of the entry.

Question D

The assistant foreman tells you to go call outside for an ambulance while he helps Speedy with Chester. You go and make the call. When you get back to entry 4, you see that Speedy is down near Chester's scoop. The assistant foreman is slowly moving toward them. What should you do? (Choose only ONE unless directed to "Try again!")

13. Go into the entry and help the foreman take care of Chester and Speedy.
14. Run into the entry to get the assistant foreman and bring him out of the entry.
15. Yell to the assistant foreman to get out and then go get the shooter and drill man to help you.
16. Go get some SCSR and then come back to help the assistant foreman and scoop operators.

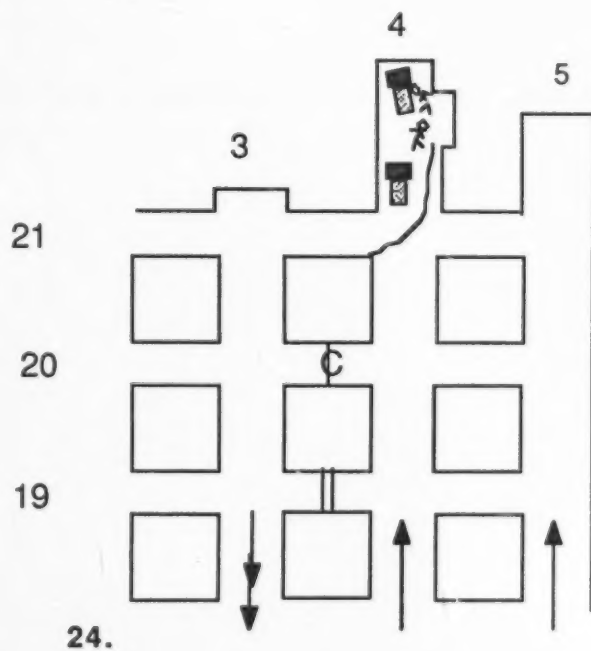
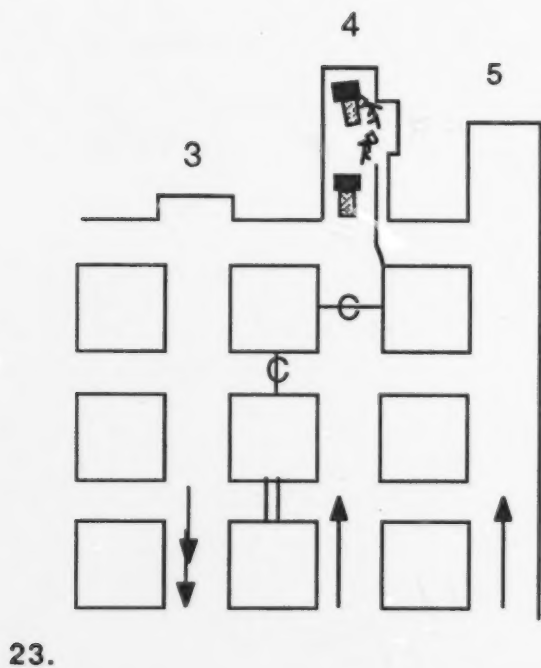
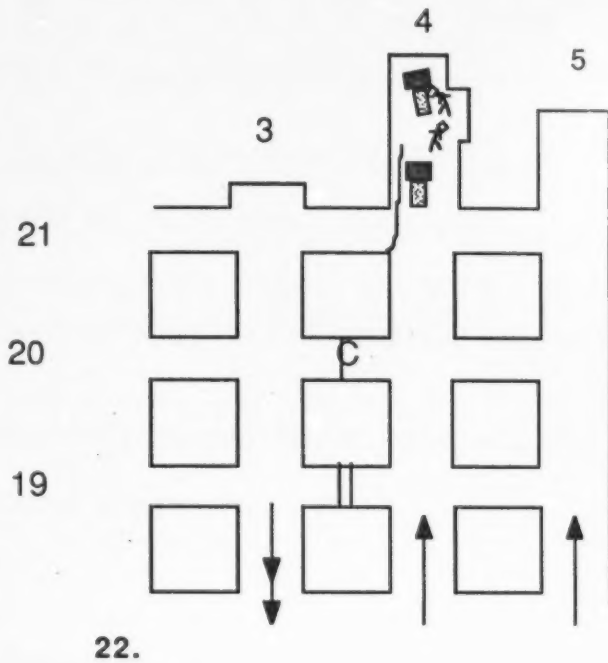
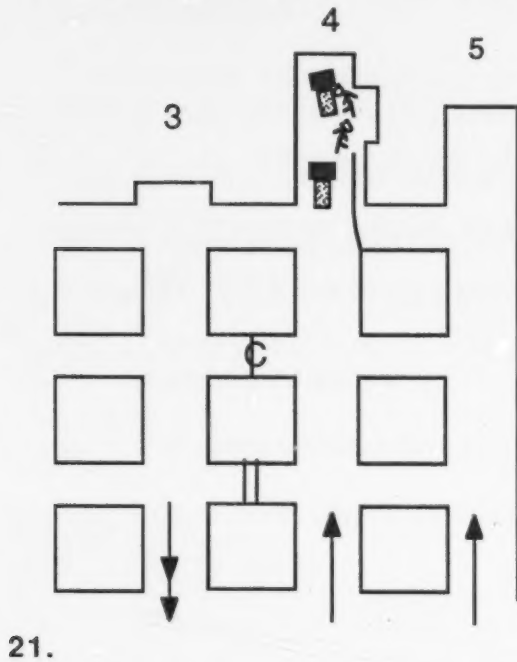
Question E

When you, the shooter, and the drill man get to entry 4 the assistant foreman is down. How should you help the three unconscious miners? (Choose only ONE unless directed to "Try again!")

17. Ventilate entry 4.
18. Each of you hold your breath, then go in and drag the men to safety.
19. All of you should get the SCSRs, put them on, and go in and drag the men to safety.
20. Call for a mine rescue team.

Question F

In order to quickly and safely ventilate entry 4, which map shows how you should hang curtains? (Choose only ONE unless directed to "Try again!")



Question G

You have decided on the best way to ventilate #4 entry. Now you need to recover the victims. What is the safest way do this? (Choose only ONE unless directed to "Try again!")

- 25. Call outside for a CO spotter.
- 26. Don't try to recover victims yourselves. Wait for the rescue team.
- 27. Advance the curtain up the right side of entry #4, keeping yourselves in good air.
- 28. Install line posts on 5-foot centers on the right side of the entry. Hang a line curtain on them as you advance.

Question H

You and your two buddies bring the three victims out of the mine and they are taken to a local hospital. Chester died from CO poisoning, but Speedy and the assistant foreman survived.

Looking back on the accident what things should have been done to prevent it? (Select as MANY as you think are correct.)

- 29. Preshift examination should have indicated that ventilation had fallen behind.
- 30. A flame safety lamp should have been used to check for CO as soon as Chester went down.
- 31. The assistant foreman and crew members should have detected and corrected inadequate ventilation.
- 32. Gas checks should have been made as soon as scoop reached the working face.
- 33. You and Speedy should have questioned why you were feeling ill.

WHEN YOU HAVE MADE YOUR SELECTION(S) DO NEXT QUESTION.

Question I

List all of the federal, state or company violations, or bad practices, that occurred in this problem.

This exercise is based on an actual accident in which 3 miners were killed and another was hospitalized. The miners' failure to recognize CO poisoning and their returning to bad air in attempts to rescue others contributed to their deaths.

Scoring your performance

1. Count the total number of responses you colored in that were marked "correct." Write this number in the first blank on the answer sheet.
2. Count the total number of "incorrect" responses you colored in. Subtract this number from 23. Write the difference in the second blank on the answer sheet.
3. Add the numbers on the first and second blanks. This is your score.

The best possible score of 33 results from selecting all the correct answers and no wrong answers. The worst possible score of zero results from selecting all the wrong answers and no correct answers.

Appendix B: Answer Sheet Blanks

These are the answer sheet blanks. Copies of these blank answer sheets may be duplicated in the normal fashion. However, the answers that are found within the brackets must be printed on these blank answer sheets in latent image ink. These answers are found in Appendix C. If you have the capability to print latent image ink, make copies of the blank answer sheets. Then make a mimeograph master of the latent image answers that appear in Appendix C. Then print the invisible latent image ink on the blank answer sheets, being careful to make sure all pages print and that the appropriate answers line up with the appropriate blanks. The Master Answer Sheet in the first part of this document shows all the latent image answers in their proper place.

Most companies and trainers prefer to purchase preprinted answer sheets. You may obtain copies of preprinted latent image answer sheets from the University of Kentucky or the National Mine Health and Safety Academy. The addresses and telephone numbers for these two agencies are listed in the footnote on page three of this document. Instructions for printing your own latent image answer sheets are also available from these two agencies.

The exercise may be administered in small groups or individually. Used individually, you will need one answer sheet for each person in your class. If you use the exercise in small groups, you will need one answer sheet for each 3 to 5 persons in your class. The answer sheets are consumable. You will need a new set for each class.

Special latent image marking pens are also needed by each person who marks an answer sheet. These may be obtained from the University of Kentucky IMMR office or the National Mine Health and Safety Academy. The addresses and telephone numbers for these two agencies are listed in the footnote on page 3 of this document. You may also purchase latent image marking pens and latent image ink supplies from A. B. Dick Company, 5700 West Touhy Avenue, Chicago, Illinois, 60648, (312) 763-1900. The A. B. Dick Chicago Office can put you in touch with the local supplier for your area.

Answer Sheet for Chester O. Peterson Exercise

Use this answer sheet to mark your selections. Rub the special pen gently and smoothly between the brackets. Don't scrub the pen or the message may blur. Be sure to color in the entire message once you make a selection. Otherwise you may not get the information you need.

Question A (Choose only ONE unless directed to "Try again!")

- | | | |
|----|---|---|
| 1. | [|] |
| | [|] |
| 2. | [|] |
| | [|] |
| 3. | [|] |
| 4. | [|] |

Question B (Choose only ONE unless directed to "Try again!")

- | | | |
|----|---|---|
| 5. | [|] |
| 6. | [|] |
| 7. | [|] |
| 8. | [|] |

Question C (Choose only ONE unless directed to "Try again!")

- | | | |
|-----|---|---|
| 9. | [|] |
| 10. | [|] |
| 11. | [|] |
| | [|] |
| 12. | [|] |
| | [|] |

Question D (Choose only ONE unless directed to "Try again!")

- | | | |
|-----|---|---|
| 13. | [|] |
| 14. | [|] |

Question D (continued)

15. []
[]

16. []
[]

Question E (Choose only ONE unless directed to "Try again!")

17. []

18. []

19. []

20. []

Question F (Choose only ONE unless directed to "Try again!")

21. []

22. []

23. []

24. []

Question G (Choose only ONE unless directed to "Try again!")

25. []

26. []

27. []

28. []

Question H (Select as MANY as you think are correct.)

29. []
[]

30. []
[]

Question H (continued)

31. []
[]
32. []
[]
33. []
[]

Question I

END OF PROBLEM

Finding your score

Number of "Correct" answers you colored in = (1) _____

23 minus the number of incorrect answers you colored in = (2) _____

Add blanks one and two to get your total score = (3) _____

Highest possible score = 33

Lowest possible score = 0

TRAINEE'S QUESTIONNAIRE

- 1) name of exercise _____
- 2) your age _____ 3) your sex _____ M _____ F 4) years underground coal miner _____
- 5) your job title _____

Check all the areas in which you have special training, certification, and/or that you routinely perform.

	<u>Special Training</u>	<u>Certification</u>	<u>Routinely Perform</u>
6) Mine Foreman	_____	_____	_____
7) Mine Safety Committee	_____	_____	_____
8) Mine rescue	_____	_____	_____
9) CPR	_____	_____	_____
10) Advanced first aid	_____	_____	_____
11) EMT	_____	_____	_____
12) Advanced life support	_____	_____	_____
13) Other (describe) _____	_____	_____	_____

Think about the exercise you just finished. Circle the number which tells how much you agree or disagree with the following statements.

	<u>Definitely Yes</u>		<u>Definitely No</u>	
14) This problem could happen in real life.	4	3	2	1
15) This exercise will help me remember something important if I am ever in a similar situation.	4	3	2	1
16) I learned something new from the exercise.	4	3	2	1
17) The exercise took too long to complete.	4	3	2	1
18) I liked working the exercise.	4	3	2	1
19) The instructor's directions were clear.	4	3	2	1
20) The written directions in the exercise were easy to understand.	4	3	2	1
21) The diagrams, charts, and pictures were easy to understand.	4	3	2	1
22) The scoring procedures were easy to understand.	4	3	2	1
23) The exercise was easy to read.	4	3	2	1

If you have anything more to say about the exercise, please write on the back of this page. Thank you.

Appendix C: Latent Image Answers

These pages contain the latent image answers that must be printed in the blanks of the answer sheet in Appendix B. These answers are spaced and sequenced correctly so that they exactly match up with the appropriate blanks on the answer sheet blank.

Once the latent image ink answers have been printed on the answer sheet blanks, the special developing pen reveals the formerly invisible (latent image) printed message.

You may purchase preprinted answer sheets or you may prepare your own copies. To learn more about this option, and to determine how many answer sheets and special pens you will need, see the introductory section for Appendix B.

The assistant foreman tells you to go load entry 3 like your supposed to. Try again!

Correct! The assistant foreman tells you that he will take care of it later. Do next question.

There is something else that you should do now. Try again!

Entry 3 doesn't need a curtain for ventilation. Try again!

There is something you should do first. Try again!

There is something you should do first. Try again!

This is not the best thing for you to do. Try again!

Correct! Do next question.

This will put you and Speedy in danger. Try again!

This is not the best thing to do now. Try again!

Correct! You go to entry 5 and tell the assistant foreman that Chester is down. Do next question.

This will put you in danger. Anyway, this is not the time to argue with Speedy. Try again!

Soon all of you are down and no one is left to help you. Try again!

This will put you in danger. Try again!

Correct! The assistant foreman keeps moving toward the face. You t
ram your scoop to entries 1 and 2 and pick them up. Do next question.

Although this is a tough decision to make, SCSRs are to be used only for
escape. . . not for rescue. Try again!

Correct! This is the safest option. Do next question.

This is not possible. You would be overcome. Try again!

SCSR are not to be used for rescue. Try again!

By the time they arrive, it will be too late to help the victims. Try again!

This will not ventilate entry 4. Try again!

This is not the best way to ventilate entry 4. Try again!

This is not the best way to ventilate entry 4. Try again!

Correct! This is the best way to ventilate entry 4. Do next question.

This is not the best thing to do. Try again!

There may not be enough time to wait for the rescue team. Try again!

Correct! Do next question.

This is not the best thing to do. Try again!

Correct! The ventilation as shown on Figure 1 was not adequate. This
should have been noted during the preshift examination and corrected.

A flame safety lamp will not tell you when small but deadly levels of CO are
present.

Correct!

Equipment should not be taken into the working face until a methane test is made.

Correct! Miners should know symptoms of CO poisoning, of poisoning from other mine gases, and of O₂ deficiency.